High SBS-Threshold Er/Yb Co-Doped Phosphate Glass Fiber Amplifiers for High Power, Sub-us Pulsed, Narrow Linewidth, All Fiber-Based Laser Transmitter, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

In order to implement the monolithic high power narrow linewidth pulsed all fiber-based laser transmitter by using a MOPA configuration for NASA's active remote sensing spectroscopy, NP Photonics propose to develop the high SBS-threshold, single-mode (SM), polarization maintaining (PM), high power amplifiers for the sub-microsecond pulses with transform-limited linewidth, leveraging on NP's proprietary patented large core SM PM highly Er/Yb co-doped phosphate glass fibers (LC-EYPhF). We will use our proprietary patented single-frequency Q-switched fiber laser seed that we have developed recently in order to make the whole high power narrow linewidth pulsed fiber laser transmitter compact and expandable to spaceborne or UAV platforms. In Phase I, one new SM PM LC-EYPhF fiber with large core of 25 micron will be fabricated and two power amplifier stages using NP's large core highly co-doped Er/Yb phosphate glass fibers will be implemented in order to demonstrate 5-kW peak power and 2.5-mJ pulse energy with SBS-free for NASA's active remote sensing fiber laser pulses at 765 nm by using NP's SINGLE-MODE phosphate fiber amplifiers.

Anticipated Benefits

The proposed amplifier can be used for narrow linewidth CW and pulse amplification in ns/us regime due to the high SBS-threshold threshold. The proposed narrow linewidth pulsed fiber lasers in MOPA can be used for high resolution laser spectroscopy, velocimetry, anemometry, coherent Lidar, imagery, laser frequency conversion, and ranging finding owing to their high spatial and spectral qualities. NASA's Goddard Space Flight Center, Langley research center, and Ames Research Center have been investigating a number of remote sensing concepts using fiber lasers. For example, they are developing the fiber laser spectroscopic instruments for absorption lines of oxygen in the range of 760-770 nm to determine atmospheric pressure and temperature from their effect on the shape and strength of the A band absorption lines. The proposed high SBS-threshold high power amplifiers result in high power narrow linewidth pulsed fiber laser transmitter at 765 nm that is ideal source for NASA's fiber laser spectroscopic instruments from ground, airborne, and space-based platform. Also, it can be used in other planned missions or technology programs, such as Doppler Wind Lidar, Lidar for Surface Topagraphy (LIST), and Earth and Planetary Atmospheric Composition (ASCENDS).planned missions or technology programs, such as Doppler Wind Lidar, Lidar for Surface Topagraphy (LIST), and Earth and Planetary Atmospheric Composition (ASCENDS).

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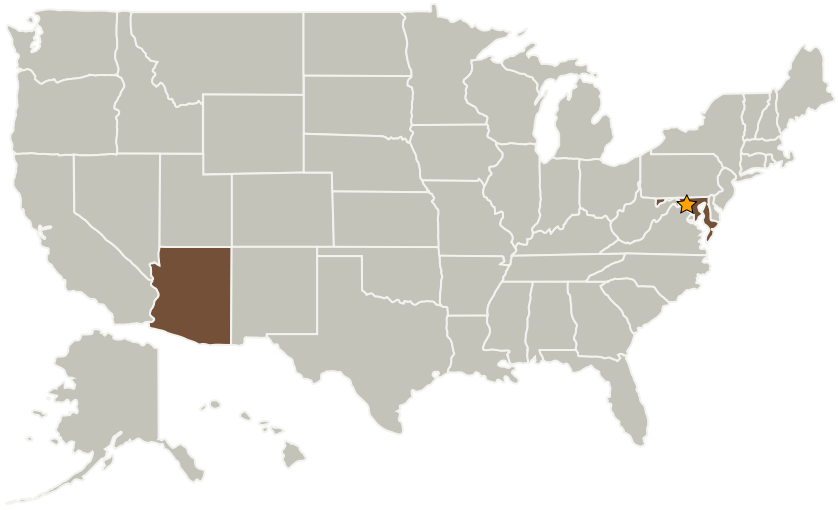
Completed Technology Project (2009 - 2009)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
NP Photonics, Inc.	Supporting Organization	Industry	Tucson, Arizona

Primary U.S. Work Locations	
Arizona	Maryland

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Mark A Stephen

Principal Investigator:

Wei Shi

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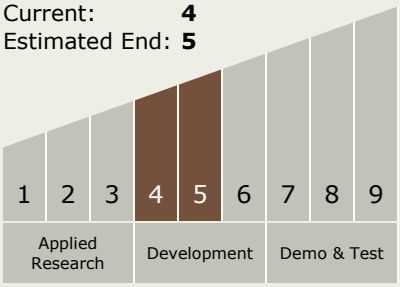
Completed Technology Project (2009 - 2009)

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers